Personalized Food for Health: Food Disruption Challenge for SME

International Conference on Small and Medium Enterprise Empowerment (ICSMEE)
Thursday, October 11th 2018
UN5 Inc, Universitas Sebelas Maret, Surakarta City, Indonesia
Website: http://icsmee.psp.kumkm.lppm.un5.ac.id/

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Faculty of Agro-industry
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Food for health

Hippocrates (400 B.C.)
Father of Medicine

“Let thy food be thy medicine and the medicine be thy food”

Ancient Ayurvedic Proverb

“When diet is wrong, medicine is of no use.
When diet is correct, medicine is of no need”
Food for health: Food guideline

Normal Pyramid

Sports Nutrition Pyramid

Keto Food Pyramid

Atkins Lifestyle Food Guide Pyramid

Vegan Food Pyramid

Mediterranean Diet Pyramid

Obesity = 650 million in 2016

Diabetes Prevalence

Heart disease = 5 million in 2011

Are Food guidelines effective?

Over-weight population
Diabetes
Heart disease
Cancer

Sources:
- WHO
- World Health Organization
Personalized medicine

Current Medicine/Food
One treatment fits ALL

Future Medicine/Food
More Personalized diagnostics

Disruption Challenge

Creative disruption!

Exponential Technology
IoT...Internet of Things
AI...Artificial Intelligence

Domino Impact
Artificial Intelligence and Data Management emerge DISRUPTIVE INNOVATION

**Definition: Artificial Intelligence (AI)**

Mind or Machines  
Cognitive Science Changing  
Artificial Intelligence

“any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.” [1]

“a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".”[2]

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[1] Definition of AI as the study of intelligent agents:  
Artificial Intelligence (AI) & Data management

- Internet of Things (IoT): hardware, software
- Finance (FINTECH)
- Heavy industry
- Construction
- Medical care
- Education
- Food

• 3D food printer: small machine produces a variety of food
• Food design: personalized food

Personalized Food: Scientific Concept – AI

<table>
<thead>
<tr>
<th>Human-being</th>
<th>Gut-microbiome</th>
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<tbody>
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Waraporn Boonsuphiph, Ph.D. (Kasetsart University, Thailand)
NUTRITIONAL GENOMICS

Specific traits are associated with health/disease

Genes interact with environmental factors

Bioactive compounds interact directly/indirectly with gene & alter physiological traits
Resveralogues: resveratrol derivatives

Switch a specific category of genes back on

made cells look youthful & start dividing

Other functions:
- Antioxidant
- Anti-inflammatory
- Anti-viral
- Cancer chemopreventive
- Protect from infection
- Protect from ischemia
- Prevent aging
- Cardioprotective
- Neuroprotective
- Reduce obesity

HOT ISSUE: GUT MICROBIOME

Intestinal Flora Affects Your Health

https://dipters.com/10-ways-improve-gut-microbiome/

Immunity
Providing a physical barrier to invasive microbes, our gut flora enhances the functionality of the immune system.

Obesity
In 2009, Dr. Krajmalnik-Brown discovered gut bacteria of obese patients differs significantly from normal individuals.

Vitamins
Bacteria in the gut plays a direct role in the synthesis of vitamin B and help with absorption of calcium and iron.

Inflammation
Gut flora likely plays a major role in the development of various inflammatory diseases including IBD and UC.

Metabolism
Metabolic activity of the gut flora allows our body to utilize food that would otherwise not be digested.

Autism
New research by Dr. Krajmalnik-Brown suggests a link between autism and decreased gut bacterial diversity.

Bad Gut Microbes = Increased Inflammation = Poor Quality of Life
Gut Microbiome
Function on Host

- **Metabolic function** – breakdown of non-digestible compounds such as resistant starch or plant oligosaccharide and polysaccharides

- **Trophic function** – control of proliferation and differentiation of epithelial cells and immune system maturation

- **Protective function** – competitive exclusion with pathogen by intestinal surface occupying and antimicrobial production

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**Gut Microbiome**

"We are not alone"

- **Colon**: $10^{13-10^{12}}$ cfu/ml
  - Bacteroides
  - Bifidobacterium
  - Clostridium
  - Ruminococcus
  - Peptostreptococcus
  - Fusobacterium
  - Eubacterium
  - Bacillus
  - Streptococcus
  - Enterococcus
  - Akkermansia

- **Ilium**: $10^9-10^3$ cfu/ml
  - Lactobacillus
  - Enterococcus
  - Bacteroides
  - Clostridium
  - Enterobacterium

- **Stomach**: $10^6$ cfu/ml
  - Streptococcus
  - Lactobacillus
  - Candida
  - Helicobacter

- **Duodenum**: $10^{4-10^4}$ cfu/ml
  - Lactobacillus
  - Streptococcus
  - Candida
  - Bacteroides

- **Jejunum**: $10^8-10^7$ cfu/ml
  - Lactobacillus
  - Streptococcus
  - Candida
  - Bacteroides

Source: Agro-Ind. Kasetsart University

www.agro-thu.ac.th
### Bacteria: Human Cells Ratio

**Who is the boss?**

<table>
<thead>
<tr>
<th>Population segment</th>
<th>Body wt (kg)</th>
<th>Age (y)</th>
<th>Blood vol (l)</th>
<th>RBC count (10^12/L)</th>
<th>Total human cells (10^{12})</th>
<th>Total bacteria (10^{12})</th>
<th>B:H</th>
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<tbody>
<tr>
<td>Ref. man</td>
<td>70</td>
<td>20-30</td>
<td>4.9</td>
<td>5.0</td>
<td>30</td>
<td>38</td>
<td>1.3</td>
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<tr>
<td>Ref. woman</td>
<td>63</td>
<td></td>
<td>3.9</td>
<td>4.5</td>
<td>21</td>
<td>44</td>
<td>2.2</td>
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<tr>
<td>Young infant</td>
<td>4.4</td>
<td>4weeks</td>
<td>0.4</td>
<td>3.8</td>
<td>1.9</td>
<td>4.4</td>
<td>2.3</td>
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<tr>
<td>Infant</td>
<td>9.6</td>
<td>1</td>
<td>0.8</td>
<td>4.5</td>
<td>4</td>
<td>7</td>
<td>1.7</td>
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<tr>
<td>Elder</td>
<td>70</td>
<td>66</td>
<td>3.8^{(3)}</td>
<td>4.8</td>
<td>22</td>
<td>38</td>
<td>1.8</td>
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<tr>
<td>Obese</td>
<td>140</td>
<td></td>
<td>6.7</td>
<td>5.0^{(4)}</td>
<td>40</td>
<td>56</td>
<td>1.4</td>
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### GUT vs. BRAIN + OTHERS

- **Influence on:** motility, secretion, nutrient delivery, microbial balance
- **Gut-Brain Axis**
  - **DIET**
  - **Microbiota**
  - Influence on: neurotransmitters, stress/anxiety, mood, behavior
For a better life! Nestlé brings human DNA to individual food production.
Hope to help solve health problems.
Tangsiri 03/09/2018

It is known that many countries are entering the elderly society. Young people today are more health conscious. It is the origin of Nestle’s new strategy to develop individualized foods through the introduction of DNA.


Nestlé's new strategy:

Nestlé is using DNA to create personalized diets in Japan

Japanese

~100,000 member

Nestle sends the device to collect DNA samples at home

Members use an app to post pictures of what they’re eating.

Nestlé then recommends dietary changes and supplies specialized supplements that can be sprinkled on or mixed into a variety of food products
Campbell Soup (Nestlé)
SAN FRANCISCO — Personalized nutrition is “the next big opportunity” for packaged food companies.

Habit, a San Francisco-based start-up
- Launched in 2017
- Develops nutrition recommendations based on an individual’s biology, metabolism and personal goals, while offering one-on-one wellness and nutrition coaching.

“This is the complexity of the personalized nutrition space,” “One of the things: focused on marrying biology and behavior to get to a holistic recommendation, recognizing someone’s body, mind and heart at the same time.”
Food chain for personalized food

To maximize yield & bioactivity

Nutrition & functional compound

IoT in Smart Farming
(Precision Farming)

smart sensing & monitoring

cloud-based event and data management

smart control

smart analysis & planning
SMART FARMING: THAILAND

Smart Farm (Thailand) Co., Ltd.
http://smartfarmthailand.com/precisionfarming/

EGGPLANT

Weather for ถึงสิ้นเดือนมีนาคม:

<table>
<thead>
<tr>
<th>Day</th>
<th>Today</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
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More at Dail 10

Solar Monitoring

Weather Monitoring

Rain Monitoring

Soil/Leaf Data History

Database
Intelligent Technology Smart Farming, Modern agriculture management for rice paddy field in Thailand

Personalized Food: Rice product for diabetes

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